Appl. No.: 10/707,556
Amdt. Dated: 10/16/2005
Reply to Office action of: 09/22/2005

AMENDMENTSTOTHEDRAWINGS:

There are no amendments to the drawings presented herewith.

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REMARKS/ARGUMENTS

Claims 1 – 22 remain in this application. Claim 1 has been amended to correct a typographical error and overcome the Examiner's resulting objection thereto.

The examiner has acknowledged that claim 7 would be allowable if rewritten in independent form incorporating all of the limitations of the base claim and any intervening claims, and that claims 8 – 11, 19, 21, and 22 are allowable as being dependent on claim 7. By this amendment claim 7 has been amended to independent form incorporating all of the limitations of the base claim and intervening claims. Therefore, claims 7 – 11, 19, 21, and 22 are in condition for allowance, and such action is respectfully solicited.

No new subject matter has been introduced.

Applicant thanks the Examiner for correcting the typographical error in his information disclosure statement filed 12/20/2003.

Appl. No.: 10/707,556
Amdt. Dated: 10/16/2005
Reply to Office action of: 09/22/2005

Claims 1, 2, and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Blades (US 5729145). Specifically, the Examiner states:

FIG. 13

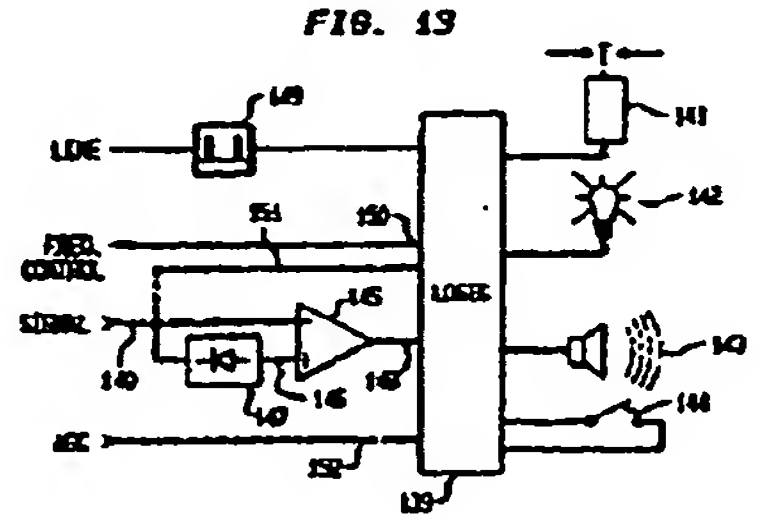
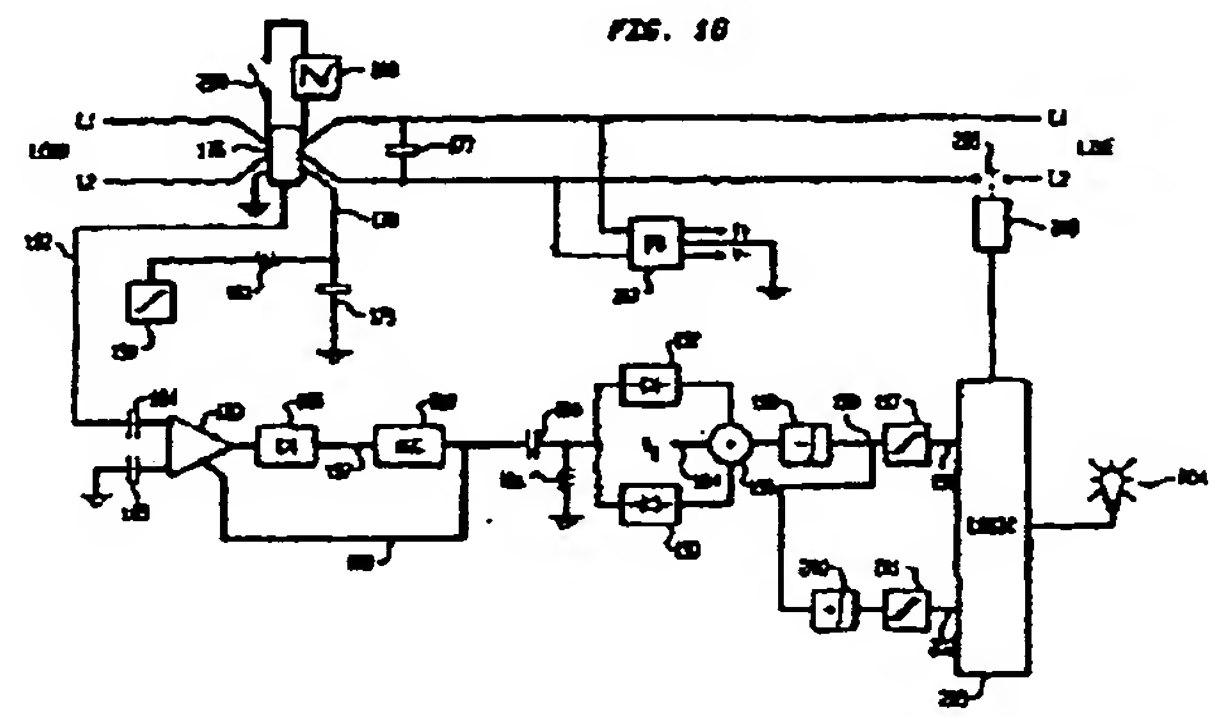


FIG. 16



With regard to Claim 1 Blades teaches a method for detecting an arc and protecting a load utilizing an electronic microprocessor based system to acquire samples of the current through a load, calculating an average value, of the acquired samples, referred to as the exponential running average (column 30 lines 42-46), updating the average value with each newly acquired sample (column 30 lines 65-67 & column 31 lines 1-3) and calculating a variable from the calculated average current value (column 31 lines 14-26).

Blades also teaches the step of disconnecting the feed from the sampled load and activating an alarm signal, which is an LED and an audible alarm (column 24 lines 64-67 & column 25 lines 1-6).

Blades further teaches the use of a dynamic threshold derived from the signal itself, to be used as an arc limit in detecting arc faults in a system (column 24 lines 41-43).

Blades does not teach the use of the calculated variable, referred in the reference as the synchronous average, as the arc limit for the signal, referred to in the reference as the dynamic threshold. However, Blades discloses that the same microprocessor can be used to derive a dynamic threshold, calculate the synchronous average value, and disconnect the feed from the load while signaling an alarm (column 25 lines 29-39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the two teachings of Blades by using the synchronous average calculated by the microprocessor as the dynamic threshold for the purpose of desensitizing the system to noise thus preventing a false trip, while allowing the system to detect an actual fault with greater accuracy.

For the purpose of this office action, the synchronous average (column 31 lines 14-26) taught by Blades, will be considered to be the arc detection threshold and the exponential running average (column 30 lines 42-48) will be considered as the average current value.

With regard to Claim 2, Blades, in figure 16, teaches a step wherein the current acquisition (176) is carried out independently for the load connected to the electrical assembly prior to the load.

With regard to Claim 20, Blades teaches a step wherein an average value is updated for each new current acquisition, taking into account eight or more immediately preceding current acquisitions (column 30 lines 42-46 & 61-63). Blades uses the value of 512 samples in one example.

Additionally, Claim 20 further limits Claim 1 only in the regard that it gives a specific range for the amount of samples that make up an average.

However, I the case In re Aller, the court stated, "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See MPEP §214.05[R-1].

Therefore, Claim 20 is rejected over "obviousness of ranges" as well.

Applicant respectfully traverses this rejection. The key to Applicants' invention is a method of detecting an arc in an automotive electrical system, thus in a DC electrical system utilizing a microprocessor based system that takes at least two samples of the amount of current circulating through the monitored load and then calculating a running average value updated with each newly acquired sample. A variable is calculated from this average current value indicating an arc limit allowing for the detection of an arc while preventing false positives. Once an arc is detected at least one alarm signal is sent and the feed to the load is disconnected.

A fair reading of Blades reference discloses a method and apparatus for detecting arcing in an AC current by monitoring the line noise and looking for cycle gaps or noise occurring less than 100% of the cycle duration (see for example, Col. 26, lines 21 – 34). That is the apparatus and method of Blades is looking for high-frequency noise exhibiting certain distinctive patterns in both the time and frequency domains which have been discovered by Blades to be characteristic of arcing (see for example, Col. 5, lines 60 – 65). Thus, Blades requires the use of a narrow-band sweep detector to monitor the line for line noise which includes noise which is generated by broadcast signals such as radio, over line communications noise, permissible arcing noise such as from electric motors and the like from the noise created by arcing which needs to be prevented (see for example, Col. 6, lines 47 – 67). This front-end sweep detector is critical to the Blades teaching because AC lines carry many types of noise much of which is wanted and this must be removed from the signal to be processed by the back-end analyzer in order to provide useful arc prevention monitoring. In addition, the noise associated with arcing on an AC line exhibits a peculiar signature of only being present during a portion of the AC current cycle and therefore showing dead spots of no noise during the same portion of the AC current cycle (see for example, Col. 6, lines 1 – 33). However, even this signature is not solely indicative of an unwanted arcing thus sampling of a very large number of samples is required to provide a satisfactory level of no false positives (see for example, Col. 9, line 52 – Col. 10, line 18). To process this large number of samples quickly enough the preferred analyzer back-end of the Blades reference does not use a microprocessor (see for example, Col. 24, lines 56 – 60, Col. 26, lines 21 – 34, Figs. 13 & 16). Thus, the Blades reference teaches the sampling of the current of an AC circuit with

a sweep detector to filter only a portion of the detected noise having a characteristic cyclic footprint associated with arcing in an AC circuit to an analyzing circuit designed to calculate a running average and arcing threshold. It does not teach how to sample the current of a DC circuit to determine when arcing is occurring in this DC circuit. In order to detect unwanted arcing with an acceptable number of false positives requires large numbers of samples to be analyzed, in fact hundreds of samples. In order to analyze such large numbers of samples quickly enough to prevent dangerous arcing from causing damage a microprocessor analyzing system is not recommended.

Blades does not teach how to take the samples of the current and directly determine an average value, instead this reference requires that the sampling first be done and filtered by a sweep detector circuit and these samples then are analyzed. Applicant's claimed invention does not require a sweep detector circuit prior to the analyzer circuit. Furthermore there is no teaching, or suggestion that any DC circuit can utilize the Blades invention. There is nowhere to be found the necessary impetus to remove a critical part of the Blades teaching so as to allow for such DC circuit analysis. In fact, the Figures 13 & 16 cited by the Examiner clearly show circuits using logic chips preferably not comprising microprocessors because the extremely high number of samples (512 samples in one example cited by the Examiner) required to be analyzed in the Blades teaching to allow for positive detection of arcing where Applicant's claimed invention requires as few as 2 samples. Furthermore, being able to utilize as few as 2 or as many as about 8 samples is not a simply "discovering of the optimum or workable ranges by routine experimentation" compared to the critical requirement of hundreds of samples taught in Blades. Without first having read Applicant's application one skilled in the art would find no teaching or suggestion to take the teaching of Blades and modify it, as suggested by the Examiner, to reach the Applicant's claimed invention.

Clearly, when viewed in this light the Blades reference does not disclose, teach, or suggest the use of the microprocessor based detection circuit utilizing current samples to recognize and prevent arcing in an automotive DC electrical circuit of Applicants' present invention.

Claims 3 – 6, 12 – 15 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Blades in view of Macbeth (US 6798628). Specifically, the Examiner states:

With regard to Claims 3 & 4, Blades teaches the method discussed above in Claim 1 and further teaches the step of storing an arc detection threshold in a register once derived by a microprocessor (Column 25 lines 29-37). Blades also teaches updating the value of the arc detection threshold and average current value for each new sample (column 30 lines 42-46 & 65-67 & column 31 lines 1-3).

Blades does not teach a step wherein said electronic system has a register of rated currents to be circulated through teach of at least one of said loads determining preset current values indicating a maximum limit, a minimum limit, and an arc detection threshold for each of sad at least one load.

Macbeth teaches the method as described in Claim 3 wherein an arc fault detection circuit has two predetermined arc fault detection levels indicating maximum and minimum current levels (column 2 lines 13-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades with Macbeth for the purpose of providing greater noise immunity and accuracy in a system that detects series and parallel arc faults.

With regard to Claim 5, Blades teaches a method of arc fault protection as described in Claim 4, wherein the calculation of an average current is used in arc detection circuitry (column 30 lines 42-46).

Blades does not teach comparing the calculated average of the sensed current to a maximum threshold.

However, Macbeth teaches a step of comparing the sensed instantaneous current to a maximum threshold.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades and Macbeth by substituting the running exponential average for the sensed instantaneous current, to compare with a maximum threshold current, and disconnecting a load if the average exceeds the threshold limit. The motivation for doing so would be to more accurately detect parallel arc fault conditions by analyzing the noise transmitted on a power line.

With regard to Claim 6, Blades in view of Macbeth teaches the method as described above in Claim 4.

Blades does not teach a method of storing values for maximum and minimum current limits. Blades also fails to teach a comparison between an acquired instantaneous current value and a minimum current limit, if the average current value for a load channel is lower then a maximum current.

Macbeth teaches a method for storing maximum and minimum current values as described above. Macbeth further teaches a method of detecting a series arc by comparing an instantaneous current with a minimum current level if the instantaneous current level isn't greater then a preset maximum value (column 2 lines 10-17).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades with Macbeth by comparing an average current value with a maximum current value, and then comparing the instantaneous current value with a minimum current value for the purpose of more accurately detecting series and parallel arc faults by analyzing the noise transmitted on a power line.

With regard to Claim 12, Blades in view of Macbeth discloses a method as according to Claim 3 and further discloses all subject matter contained in Claim 12 except that it does not disclose that the maximum limit has a value substantially equal to about double a rated current and a minimum limit has a value substantially equal to about 10% of the rated current.

However, in the case In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) the court stated, "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See MPEP § 2144.05.

With regard to Claim 13, Blades in view of Macbeth discloses the method as according to Claim 3, and further discloses all subject matter contained in Claim 13 except that it does not disclose that the maximum limit has a value greater than double a rated current and a minimum limit has a value of lower than 10% of said rated current.

However, it has been decided that, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable

> ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).
>
> With regard to Claim 14, Blades in view of Macbeth discloses the method according to Claim 3, Blades in view of Macbeth further discloses a step wherein said arc detection threshold has a value between about 0.75 and about 0.9. Blades discloses a value of .935 which is about .9. (column 31 lines 14-26).
>
> Additionally, Claim 14 further limits Claim 3 only in the regard that it gives a specific range for the value to be used for the arc detection limit threshold. Therefore, Claim 14 is rejected over "obviousness of ranges" as well.
>
> With regard to Claim 15, Blades in view of Macbeth discloses the method as according to Claim 14. However, Blades in view of Macbeth does not disclose a step wherein an arc detection threshold is substantially equal to about 0.875.
>
> However, Blades in view of Macbeth discloses all subject matter contained in Claim 13 other than the recited arc detection threshold.
>
> However, it has been decided that, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).
>
> With regard to Claim 17, Blades teaches the method as described above in Claim 2.
>
> Blades does not teach a step wherein a sensor for acquiring current values forms a part of a shunt structure.
>
> Macbeth, teaches a method of aro detection wherein the load current is sensed across a resistive shunt element (column 4 lines 20-23).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades with Macbeth by replacing Blades' current transformer with Macbeth's resistive shunt element for the purpose of reducing costs and using less space.

Applicant respectfully traverses this rejection. The key to Applicants' invention, as described above, is a method of detecting an arc in an automotive electrical system, thus in a DC electrical system utilizing a microprocessor based system that takes at least two samples of the amount of current circulating through the monitored load and then

calculating a running average value updated with each newly acquired sample. A variable is calculated from this average current value indicating an arc limit allowing for the detection of an arc while preventing false positives. Once an arc is detected at least one alarm signal is sent and the feed to the load is disconnected.

A fair reading of Blades reference, as described above, discloses a method and apparatus for detecting arcing in an AC current by monitoring the line noise and looking for cycle gaps or noise occurring less than 100% of the cycle duration (see for example, Col. 26, lines 21 – 34). That is the apparatus and method of Blades is looking for high-frequency noise exhibiting certain distinctive patterns in both the time and frequency domains which have been discovered by Blades to be characteristic of arcing (see for example, Col. 5, lines 60 – 65). Thus, Blades requires the use of a narrow-band sweep detector to monitor the line for line noise which includes noise which is generated by broadcast signals such as radio, over line communications noise, permissible arcing noise such as from electric motors and the like from the noise created by arcing which needs to be prevented (see for example, Col. 6, lines 47 – 67). This front-end sweep detector is critical to the Blades teaching because AC lines carry many types of noise much of which is wanted and this must be removed from the signal to be processed by the back-end analyzer in order to provide useful arc prevention monitoring. In addition, the noise associated with arcing on an AC line exhibits a peculiar signature of only being present during a portion of the AC current cycle and therefore showing dead spots of no noise during the same portion of the AC current cycle (see for example, Col. 6, lines 1 – 33). However, even this signature is not solely indicative of an unwanted arcing thus sampling of a very large number of samples is required to provide a satisfactory level of no false positives (see for example, Col. 9, line 52 – Col. 10, line 18). To process this large number of samples quickly enough the preferred analyzer back-end of the Blades reference does not use a microprocessor (see for example, Col. 24, lines 56 – 60, Col. 26, lines 21 – 34, Figs. 13 & 16). Thus, the Blades reference teaches the sampling of the current of an AC circuit with a sweep detector to filter only a portion of the detected noise having a characteristic cyclic footprint associated with arcing in an AC circuit to an analyzing circuit designed to calculate a running average and arcing threshold. It does not teach how to sample the current of a DC circuit to determine when arcing is occurring in this DC circuit. In order to detect unwanted arcing with an acceptable number of false

positives requires large numbers of samples to be analyzed, in fact hundreds of samples. In order to analyze such large numbers of samples quickly enough to prevent dangerous arcingfromcausingdamageamicroprocessor analyzing system is not recommended.

Blades does not teach how to take the samples of the current and directly determine an average value, instead this reference requires that the sampling first be done and filtered by a sweep detector circuit and these samples then are analyzed. Applicant's claimed invention does not require a sweep detector circuit prior to the analyzer circuit. Furthermore there is no teaching, or suggestion that any DC circuit can utilize the Blades invention. There is nowhere to be found the necessary impetus to remove a critical part of the Blades teaching so as to allow for such DC circuit analysis.

A fair reading of the Macbeth reference discloses a method of using two detections levels for detecting both parallel and series arc faults. One set of detection levels is utilized when the sensed load is below a predetermined level indicating a series arc and a second set of detection levels is utilized when the sensed load is above a predetermined level indicating a parallel arc (see for example, Col. 2, lines 10 – 19). Or in the alternative the first and second detectors are used together in the case of the sensed load being above a predetermined level indicating a parallel arc (see for example, Col. 2, lines 32 – 42). Macbeth has the sensors sensing the current to load and uses a pair of high pass filters to block power line frequency (see for example, Col. 4, lines 9 – 19). The load current must simultaneously be sensed across resistive shunt element and a capacitor to strip off high frequency signals said signal then must be amplified and the amplified signal is compared against a predetermined reference voltage by a comparator which produces a logic signal fed to a microprocessor (see for example, Col. 4, lines 20 – 38). Thus the Macbeth reference utilizes the current level sampled against a predetermined value to find an arc fault instead of utilizing the characteristic harmonic noise of an arc fault as in Blades. There is nothing in either Macbeth or Blades to suggest that a combination of the references would produce more accurate arc fault determinations. Nor is there anything in either reference to suggest replacing the signal noise characteristic recognition algorithms of Blades with the algorithms of Macbeth based on current level values across the load and across a shunt. There is nothing to suggest in either reference that substituting an instantaneous current value for the average of hundreds of samplings of the filtered cyclic noise patterns to some predetermined current value. Neither the

Blades reference nor the Macbeth reference teaches or fairly suggests that any combination is possible or desirable. Further, there is clearly no simple testing for optimum or workable ranges between a single instantaneous value and an average value of several hundred individual values. Also, neither reference teaches the maximum or minimum current values of Applicant's claimed invention. Blades does not teach this because this reference is not looking at current values. Macbeth uses a fixed low setting of 5 amperes for series A faults to meet the standards set by UL and an upper setting of 500 amperes for series B faults again to met the standards set by UL. Clearly this does not teach that routine experimenting for a DC system which is not even suggested in Macbeth will result in setting limits other than those set out by UL to be suitable. The Blades reference and the Macbeth reference both are directed to AC circuits only and utilize characteristics only associated with AC circuits to detect arcing. Nothing in them teaches or fairly suggests that a DC circuit arcing can be detected. Thus, the only way in which one skilled in the art can arrive at Applicant's claimed invention from these references is by having first read Applicant's application.

Clearly, when viewed in this light the Blades reference, the Macbeth reference, or any combination thereof even if combinable which they are not, discloses, teaches, or suggests the use of the microprocessor based detection circuit utilizing current samples to recognize and prevent arcing in an automotive DC electrical circuit of Applicants' present invention.

Claim 16 was rejected under 35 U.S.C. 103(a) as being unpatentable over Blades in view of Ragsdale (US 5280404). Specifically, the Examiner states:

> With regard to Claim 16, Blades teaches a method of arc detection as described above in Claim 2 wherein a load is disconnected from its source by energizing a relay.
>
> Blades does not teach a step wherein a sensor for acquiring said current values is integrated into a solid state relay responsible for deactivating the load where the arc or short circuit detection is positive.
>
> Ragsdale, teaches a step of turning a solid state relay off when an arc fault is detected by a current sensor (column 4 lines 14-19).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades with Ragsdale by integrating the sensor

> with the solid state relay and using it to detect arc faults and disconnect the load from a power source for the purpose of saving space and cost while providing a reliable means for disconnecting the load from the source.

Applicant respectfully traverses this rejection. The key to Applicants' invention, as described above, is a method of detecting an arc in an automotive electrical system, thus in a DC electrical system utilizing a microprocessor based system that takes at least two samples of the amount of current circulating through the monitored load and then calculating a running average value updated with each newly acquired sample. A variable is calculated from this average current value indicating an arc limit allowing for the detection of an arc while preventing false positives. Once an arc is detected at least one alarm signal is sent and the feed to the load is disconnected.

A fair reading of Blades reference, as described above, discloses a method and apparatus for detecting arcing in an AC current by monitoring the line noise and looking for cycle gaps or noise occurring less than 100% of the cycle duration (see for example, Col. 26, lines 21 – 34). That is the apparatus and method of Blades is looking for high-frequency noise exhibiting certain distinctive patterns in both the time and frequency domains which have been discovered by Blades to be characteristic of arcing (see for example, Col. 5, lines 60 – 65). Thus, Blades requires the use of a narrow-band sweep detector to monitor the line for line noise which includes noise which is generated by broadcast signals such as radio, over line communications noise, permissible arcing noise such as from electric motors and the like from the noise created by arcing which needs to be prevented (see for example, Col. 6, lines 47 – 67). This front-end sweep detector is critical to the Blades teaching because AC lines carry many types of noise much of which is wanted and this must be removed from the signal to be processed by the back-end analyzer in order to provide useful arc prevention monitoring. In addition, the noise associated with arcing on an AC line exhibits a peculiar signature of only being present during a portion of the AC current cycle and therefore showing dead spots of no noise during the same portion of the AC current cycle (see for example, Col. 6, lines 1 – 33). However, even this signature is not solely indicative of an unwanted arcing thus sampling of a very large number of samples is required to provide a satisfactory level of no false positives (see for example, Col. 9, line 52 – Col. 10, line 18). To process this large number of samples quickly enough the preferred analyzer back-end of the Blades reference does not use a microprocessor (see for example, Col. 24, lines 56 – 60, Col. 26,

lines 21 – 34, Figs. 13 & 16). Thus, the Blades reference teaches the sampling of the current of an AC circuit with a sweep detector to filter only a portion of the detected noise having a characteristic cyclic footprint associated with arcing in an AC circuit to an analyzing circuit designed to calculate a running average and arcing threshold. It does not teach how to sample the current of a DC circuit to determine when arcing is occurring in this DC circuit. In order to detect unwanted arcing with an acceptable number of false positives requires large numbers of samples to be analyzed, in fact hundreds of samples. In order to analyze such large numbers of samples quickly enough to prevent dangerous arcingfromcausingdamageamicroprocessor analyzing system is not recommended.

Blades does not teach how to take the samples of the current and directly determine an average value, instead this reference requires that the sampling first be done and filtered by a sweep detector circuit and these samples then are analyzed. Applicant's claimed invention does not require a sweep detector circuit prior to the analyzer circuit. Furthermore there is no teaching, or suggestion that any DC circuit can utilize the Blades invention. There is nowhere to be found the necessary impetus to remove a critical part of the Blades teaching so as to allow for such DC circuit analysis.

A fair reading of the Ragsdale reference discloses an improved arc detector for a DC circuit which measures the current in line of the electrical system using a current transformer, a filtering amplifier which amplifies and clips to a square wave signals in a predetermined frequency range, and a counter to count the clipped pulses (see for example, Col. 2, lines 31 – 39). When a series of arc pulses are detected the apparatus can shut down the power by a number of means including by use of a solid-state relay (see for example Col. 2, lines 44 – 58 and Col. 4, lines 7 – 21). Since this reference was published before the Blades reference was filed this reference was clearly known to Blades and it was not incorporated into the Blades invention. This clearly shows that the combination of Blades and Ragsdale would not be obvious to one skilled in the art. Further, there is no necessary impetus for such combination to be found in either Blades or Ragsdale.

Clearly, when viewed in this light the Blades reference, the Ragsdale reference, or any combination thereof, discloses, teaches, or suggests the use of the microprocessor based detection circuit utilizing current samples to recognize and prevent arcing in an automotive DC electrical circuit of Applicants' present invention.

Claim 18 was rejected under 35 U.S.C. 103(a) as being unpatentable over Blades in view of Zuercher (US 6577138). Specifically, the Examiner states:

> With regard to Claim 18, Blades teaches a method of arc detection described in Claim 1 above.
>
> Blades does not teach a step wherein a sensor for acquiring current values is a Hall Effect sensor. Zuercher teaches a step wherein the detector includes a sensor, such as, for example, a Hall Effect or a shunt device (column 4 lines 20-21).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Blades with Zuercher for the purpose of reducing cost and allowing the Blades' method to monitor a system that uses Pulse Width Modulation.

Applicant respectfully traverses this rejection. The key to Applicants' invention, as described above, is a method of detecting an arc in an automotive electrical system, thus in a DC electrical system utilizing a microprocessor based system that takes at least two samples of the amount of current circulating through the monitored load and then calculating a running average value updated with each newly acquired sample. A variable is calculated from this average current value indicating an arc limit allowing for the detection of an arc while preventing false positives. Once an arc is detected at least one alarm signal is sent and the feed to the load is disconnected.

A fair reading of Blades reference, as described above, discloses a method and apparatus for detecting arcing in an AC current by monitoring the line noise and looking for cycle gaps or noise occurring less than 100% of the cycle duration (see for example, Col. 26, lines 21 – 34). That is the apparatus and method of Blades is looking for high-frequency noise exhibiting certain distinctive patterns in both the time and frequency domains which have been discovered by Blades to be characteristic of arcing (see for example, Col. 5, lines 60 – 65). Thus, Blades requires the use of a narrow-band sweep detector to monitor the line for line noise which includes noise which is generated by broadcast signals such as radio, over line communications noise, permissible arcing noise such as from electric motors and the like from the noise created by arcing which needs to be prevented (see for example, Col. 6, lines 47 – 67). This front-end sweep detector is critical to the Blades teaching because AC lines carry many types of noise much of which is wanted and this must be removed from the signal to be processed by the back-end

analyzer in order to provide useful arc prevention monitoring. In addition, the noise associated with arcing on an AC line exhibits a peculiar signature of only being present during a portion of the AC current cycle and therefore showing dead spots of no noise during the same portion of the AC current cycle (see for example, Col. 6, lines 1 – 33). However, even this signature is not solely indicative of an unwanted arcing thus sampling of a very large number of samples is required to provide a satisfactory level of no false positives (see for example, Col. 9, line 52 – Col. 10, line 18). To process this large number of samples quickly enough the preferred analyzer back-end of the Blades reference does not use a microprocessor (see for example, Col. 24, lines 56 – 60, Col. 26, lines 21 – 34, Figs. 13 & 16). Thus, the Blades reference teaches the sampling of the current of an AC circuit with a sweep detector to filter only a portion of the detected noise having a characteristic cyclic footprint associated with arcing in an AC circuit to an analyzing circuit designed to calculate a running average and arcing threshold. It does not teach how to sample the current of a DC circuit to determine when arcing is occurring in this DC circuit. In order to detect unwanted arcing with an acceptable number of false positives requires large numbers of samples to be analyzed, in fact hundreds of samples. In order to analyze such large numbers of samples quickly enough to prevent dangerous arcingfromcausingdamageamicroprocessor analyzing system is not recommended.

Blades does not teach how to take the samples of the current and directly determine an average value, instead this reference requires that the sampling first be done and filtered by a sweep detector circuit and these samples then are analyzed. Applicant's claimed invention does not require a sweep detector circuit prior to the analyzer circuit. Furthermore there is no teaching, or suggestion that any DC circuit can utilize the Blades invention. There is nowhere to be found the necessary impetus to remove a critical part of the Blades teaching so as to allow for such DC circuit analysis.

A fair reading of the Zuercher reference discloses the use of a sensor for generating a sensed dc current signal where said sensor may be a shunt or a Hall effect device (see for example, Col. 4, lines 1 – 4). The apparatus of the Zuercher reference allows for monitoring of a DC circuit to prevent arcing by analyzing current levels. There is no teaching or suggestion of the desirability of combining Zuercher and Blades anywhere in either reference. The required impetus for such combination is clearly

lacking. Without first having knowledge of Applicant's claimed invention there is no reason to pick bits of Zuercher for combination with Blades.

Clearly, when viewed in this light the Blades reference, the Zuercher reference, or any combination thereof, discloses, teaches, or suggests the use of the microprocessor based detection circuit utilizing current samples to recognize and prevent arcing in an automotive DC electrical circuit of Applicants' present invention.

In view of the remarks herein, and the amendments hereto, it is submitted that this application is in condition for allowance, and such action and issuance of a timely Notice of Allowance is respectfully solicited.

Respectfully submitted,

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